

Title: Ultrasonic inspection apparatus and method for evaluating ultrasonic signals

Patent Claims

1. An ultrasonic inspection apparatus for non-destructive inspection of a test body (18), said apparatus having
 - a probe, more specifically an angle beam probe (10),
 - a transmitter that is connected to the probe and generates transmitter pulses it delivers to the probe,
 - a receiver that is connected to the probe and receives echo signals and
 - a monitor (12) with a display (14) that is connected to the receiver for representing the echo signals received,said probe delivering ultrasonic pulses and insonifying them at a certain angle (\square) into the test body (18), said pulses penetrating the test body (18) where they are at least once reflected from a rear wall (24) of the test body (18), forming, as a result thereof, at least one first leg (28) that extends from the entrance surface (22) to the rear wall (24) and a second leg (30) that extends from the rear wall (24) to the entrance surface (22),
characterized in that
the echo signals received are represented on the display (14) so as to show from which leg (28, 30) they originate.
2. The ultrasonic inspection apparatus as set forth in claim 1, characterized in that the echo signals on the display (14) are represented in a diagram in the form of a measured curve (44), with time being plotted on the horizontal axis (41) and the voltage values on the vertical axis (43).
3. The ultrasonic inspection apparatus as set forth in claim 2, characterized in that an alphanumeric character is associated with the respective points of the measured curve (44) that correspond to the respective transition from one leg (28, 30) to the next leg (28, 30).

4. The ultrasonic inspection apparatus as set forth in claim 2, characterized in that a line (46) intersects the measured curve (44) at the respective one of the points of the measured curve (44) that correspond to the transition from one leg (28, 30) to the next leg (28, 30).
5. The ultrasonic inspection apparatus as set forth in claim 2, characterized in that the portions of the measured curve (44) that originate from a certain leg (28, 30) are shown on a background that is typical for the respective one of the legs (28, 30).
6. The ultrasonic inspection apparatus as set forth in claim 2, characterized in that, in the regions that originate from a certain leg (28, 30), the measured curve (44) is shown by a kind of line that is typical for the respective one of the legs (28, 30).
7. The ultrasonic inspection apparatus as set forth in any of the claims 1 through 6, characterized in that the display (14) is implemented as a colour display.
8. The ultrasonic inspection apparatus as set forth in claim 7, characterized in that the portions of the measured curve (44) that originate from a certain leg (28, 30) are placed on a coloured background that is typical for the respective one of the legs (28, 30).
9. The ultrasonic inspection apparatus as set forth in claim 7, characterized in that, in the regions that originate from a certain leg (28, 30), the measured curve (44) is shown by a colour that is typical for the respective one of the legs (28, 30).
10. The ultrasonic inspection apparatus as set forth in any of the claims 1 through 9, characterized by a means (38) that is solidly connected to the probe and serves to determine the respective position of the probe on the surface of the test body (18).

11. The ultrasonic inspection apparatus as set forth in any of the claims 1 through 10, characterized in that, taking into consideration limit values in terms of amplitude and/or spatial limits, only that region of the test body (18) to be tested is represented on the display (14) that is of interest for inspection.

12. A method of representing echo signals obtained using an ultrasonic inspection apparatus for non-destructive inspection of a test body (18), said ultrasonic inspection apparatus comprising:
 - a probe, more specifically an angle beam probe (10),
 - a transmitter that is connected to the probe and generates transmitter pulses it delivers to the probe,
 - a receiver that is connected to the probe and receives echo signals and
 - a monitor (12) with a display (14) that is connected to the receiver for representing the echo signals received,
 said method involving the following method steps:
 - delivering ultrasonic pulses through the probe,
 - insonifying the ultrasonic pulses into the test body (18) at a certain angle (\square) in such a manner that the ultrasonic pulses penetrate the test body (18) where they are reflected at least once from a rear wall (24) of the test body (18) and form, as a result thereof, a first leg (28) that extends from the entrance surface (22) to the rear wall (24) and a second leg (30) that then extends from the rear wall (24) to the entrance surface (22),
 - representing the echo signals received on the display (14),*characterized in*
 that the echo signals received are represented on the display (14) so as to show from which leg (28, 30) they originate.

13. The method as set forth in claim 12, characterized in that the echo signals on the display (14) are represented in a diagram in the form of a measured curve (44), with time being plotted on the horizontal axis (41) and the voltage value on the vertical axis (43).

14. The method as set forth in claim 13, characterized in that an alphanumeric character is associated with the respective points of the measured curve (44) that correspond to the respective transition from one leg (28, 30) to the next leg (28, 30).
15. The method as set forth in claim 13, characterized in that a line (46) intersects the measured curve (44) at the respective one of the points of the measured curve (44) that correspond to the transition from one leg (28, 30) to the next leg (28, 30).
16. The method as set forth in claim 13, characterized in that the portions of the measured curve (44) that originate from a certain leg (28, 30) are placed on a background that is typical for the respective one of the legs (28, 30).
17. The method as set forth in claim 13, characterized in that, in the regions that originate from a certain leg (28, 30), the measured curve (44) is shown by a kind of line that is typical for the respective one of the legs (28, 30).
18. The method as set forth in any of the claims 12 through 17, characterized in that the display (14) is implemented as a colour display.
19. The method as set forth in claim 18, characterized in that the portions of the measured curve (44) that originate from a certain leg (28, 30) are placed on a coloured background that is typical for the respective one of the legs (28, 30).
20. The method as set forth in claim 18, characterized in that, in the regions that originate from a certain leg (28, 30), the measured curve (44) is shown by a colour that is typical for the respective one of the legs (28, 30).
21. The method as set forth in any of the claims 12 through 20, characterized by a means (38) that is solidly connected to the probe and serves to de-

termine the respective position of the probe on the surface of the test body (18).

22. The method as set forth in any of the claims 12 through 21, characterized in that, taking into consideration limit values in terms of amplitude and/or spatial limits, only that region of the test body (18) to be tested is represented on the display (14) that is of interest for inspection.